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Letter from the Editor

Dear Reader,

It is with immense satisfaction that I present to you the fifth issue of the Penn Undergraduate Law Journal. In the following pages you will find an intellectually stimulating discourse that combines both abstract concepts, such as moral culpability in the field of biomedical ethics, and current issues, such as the need to reform the immigration process in the United States. These articles reflect the Journal's longstanding dedication to wide-ranging legal discourse, and certainly add value to PULJ's ever expanding oeuvre of interdisciplinary legal analyses.

Our first article, written by Laura Fitzgibbon of Durham University, delves deeply into the case of *CP (A Child) v First Tier Tribunal (Criminal Injuries Compensation)*, in which a child applied for compensation under the United Kingdom's Criminal Injuries Compensation Scheme for harm caused by the mother through her alcohol consumption during pregnancy. The author argues that the court was right in not granting the child compensation, for such a decision would have undoubtedly set a precedent in the criminal law for punishing mothers who consume alcohol during pregnancy, many of whom do so due to substance abuse problems, thereby unfairly criminalizing substance addiction for pregnant mothers.

In our second article, author Michael Goldstein of Southern New Hampshire University examines the Cuban Adjustment Act (CAA), a law passed during the Cold War, which streamlines the asylum process for Cuban Refugees fleeing the Castro Regime. The author argues that the CAA has become an outdated policy, one no longer benefits political refugees, but unfairly prefers Cuban immigrants to non-Cubans looking for economic opportunity in the US. The author goes on to say that, given that there is no longer a rational basis preference of Cubans refugees under the CAA, the law now contravenes the principle of Equal Protection outlined in the Fifth Amendment.

In our final article, Cat McMullen, also of Durham University, demonstrates that physician-assisted suicide is compatible with both Kantian and Utilitarian ethical frameworks. The author points to contradictions in the current legal framework surrounding physician-assisted suicide, in particular the doctrine of double effect, which permits a doctor to legally administer a lethal dosage of a pain-relieving drug if the primary aim is to relieve pain rather than to end the patient's life. The author then takes a practical approach, arguing for the passing of Lord Falconer's Assisted

Dying Bill, which would legalize physician-assisted suicide in the United Kingdom.

Despite the ostensibly disparate natures of the articles, there is common thread of suggested policy reforms that runs through this edition of the Journal and binds each of the pieces together. This includes Lord Falconer's Bill; an actual original amendment to the CAA; and an in-depth discussion of developments in Space Law that appears in our foreword, authored by Professor of Space Policy and International Affairs at the George Washington University, and University of Pennsylvania Alum, Henry Hertzfeld. Professor Hertzfeld's contribution is part of the Journal's ongoing collaboration with the Philomathean Society of the University of Pennsylvania to promote knowledge and ideas about space this year, particularly in the form of public policy. This is the first time the Penn Undergraduate Law Journal has take part in such a collaboration, which encapsulates the exciting ways in which the organization continues to grow.

Finally, I'd like to thank our Faculty Advisory Board, as well as our institutional and corporate sponsors who have made this publication possible. Particularly, I want to thank Dr. Rogers Smith and the Penn Program on Democracy, Citizenship, and Constitutionalism, who contributed support at a key time for the Journal this past year, ensuring the Journal's continued operations. Thank you to our editors who sacrifice their time and patience to make this publication possible and to our business, blog, layout, and communications teams who each add their unique value to our organization.

Sincerely,

A handwritten signature in black ink, appearing to read "Davis Samuel Cooper Berlind". The signature is fluid and cursive, with a large initial "D" and "S" and a long, sweeping tail.

Davis Samuel Cooper Berlind
Editor-in-Chief

FOREWORD

DEVELOPING ISSUES IN THE LAW OF OUTER SPACE

Professor Henry R. Hertzfeld[†]

I. INTRODUCTION

Space law is a relatively new field of law, but it is grounded in several well-developed legal areas and draws from many other legal precedents. Since space has a global presence and has always been of interest to all peoples and cultures, space law has as its foundation basic principles of international law. These are coupled with laws dealing with transportation (aviation and maritime), government development of new high technology capabilities (nuclear, security), exploration of unoccupied areas (Antarctica), and more recent commercial transactions.

Outer space is a location for doing things on Earth. And these now familiar applications of space-based capabilities – such as telecommunications, remote sensing, and navigation – are quite different from doing things in outer space itself, such as exploring distant planets, conducting research and development, building structures, and using resources found in space.

Historically, space activities were reserved primarily for government missions. Even when private companies owned space assets such as telecommunication satellites, these were either international governmental consortia or heavily regulated sectors. The international legal foundation centered on a set of United Nations negotiated treaties that were drafted and came into force in the 1960s and 1970s. As described in more detail below, they mainly reflected the concerns of governments and the political reality of two important elements: a) the Cold War and b) the fact that only the two superpowers of the time, the United States and the Soviet Union, had the technological capability to access space.

These conditions were rather stable during the first 25 years of the Space Age, with a few nations, such as France and China, developing new launch vehicles to access space and new capabilities like the U.S. Space Shuttle, which was able to transport people and larger payloads into space and be reused multiple times. But the basic premise that space is a high-risk, large up-front investment remained a uniform barrier to less capable nations and to private investment. As with all high technologies, space capabilities have matured and become available worldwide. They are still risky ventures with large start-up costs, and they only offer investors an opportunity, not a guarantee, of financially profitable re-

[†]Professor Hertzfeld is a Research Professor of Space Policy and International Affairs and Adjunct Professor of Law at The George Washington University.

turns. However, there has been a very well-documented trend of private sector interest, investment, and even success in various aspects of space activities that started around 1980, began to develop aggressively during the late 1990s, and continues to grow today. Most of the private activity has been terrestrially oriented and is focused on selling space-related products to business, consumers, and governments.

A new expansion of technologies capable of operating in outer space and providing services such as refueling and repairing satellites in orbit, providing research platforms for industrial R&D, and even recovering resources from the Moon and asteroids for re-use in space or on Earth is in the planning and development stage today.

These technologies are common to both government interests and private interests. Very few private sector entities will engage in space without some direct government partnership, either cooperatively, financially, or through regulatory or other incentives. Even those private entities that may engage in space activities directed only toward individual consumers will be required to obtain permission from their respective governments to do so, since – by treaty rules and for very practical reasons – government oversight of safety and security will necessitate a space regulatory regime.

Space technology and technological capabilities have changed. The foundations of space law have not. The critical questions facing space law today are focused on how to adopt new situations to a set of laws developed by and for different purposes. The politics of today's world are also different and will make any negotiations for new fundamental treaties dealing with space issues unlikely to be successful in a time frame to accommodate the types of changes described above.

This paper will explore the most critical issues facing space law today and describe some of the proposed approaches to adapting existing precedents and law to the unique environment of space activities.

II. THE FRAMEWORK OF SPACE LAW: INTERNATIONAL AND NATIONAL LAWS APPLYING TO SPACE AFFAIRS

After the U.S.S.R. launched the first orbiting spacecraft, Sputnik, in October of 1957, the need to formalize an international legal regime for space was apparent. Under the auspices of the United Nations in 1959, 18 nations formed the Committee on Peaceful Uses of Outer Space (COPUOS), beginning the process of negotiations that led to a set of space treaties. These treaties were designed to encourage States to use space only for peaceful purposes and to engage in cooperative efforts to explore and use outer space for the benefit of all mankind. The essence of space law began with the U.N General Assembly Resolution 1721 in

December 1961¹ and was followed by the 1963 Resolution, Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space.²

The first U.N. treaty on outer space, the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, was adopted in December 1966 and entered into force on 10 October 1967; it has been the underlying basis of international space law since then. Four additional treaties dealing specifically with outer space, all drafted and ratified in the relatively short period between 1967 and 1979, expand on the basic principles and topics of the 1967 Outer Space Treaty.³ With the exception of the last treaty, the Moon Agreement, all have been ratified by most, if not all, major space-faring nations.

In addition, there have been a number of “soft law” U.N. space agreements in the form of General Assembly Resolutions on various space activities, including direct television broadcasting, remote sensing, the use of nuclear power sources in space, and a re-emphasis on the use of space to address the needs of developing countries.⁴ Most recently, COPUOS has issued guidelines on the mitigation of debris removal and guidelines on a Safety Framework for Nuclear Power Source Applications in Outer Space.⁵ Other examples of soft law in space affairs are pro-

1 *Resolution 1721 (XVI), International Co-operation in the Peaceful Uses of Outer Space*, UN General Assembly, 1085th mtg (Dec 20, 1961), A/RES/1721(XVI) A and B.

2 *Resolution 1962 (XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, UN General Assembly, 1280th mtg (Dec 13, 1963), A/RES/18/1962.

3 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 18 UST 2410, 610 UNTS 205 (1967) (Outer Space Treaty, or “OST”); *The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 19 UST 7570, 672 UNTS 119 (1968) (“ARRA”); *The Convention on International Liability for Damage Caused by Space Objects*, 24 UST 2389, 961 UNTS 187 (1972) [Liability Convention, or “L.C.”]; *The Convention on the Registration of Objects Launched into Outer Space*, 28 UST 695, 1023 UNTS 15 (1975) [Registration Convention, or “R.C.”]; *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 1363 UNTS 3 (1979) (Moon Agreement, or “M.A.”).

4 *Resolution 1962 (XVIII)*, UN General Assembly (Dec 13, 1963) (cited in note 2); *Resolution 37/92, Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting*, UN General Assembly, 100th mtg (Dec 10, 1982), A/RES/37/92; *Resolution 41/65, Principles Relating to Remote Sensing of the Earth from Outer Space*, UN General Assembly, 95th mtg (Dec 3, 1986), A/RES/41/65; *Resolution 47/68, Principles Relevant to the Use of Nuclear Power Sources in Outer Space*, UN General Assembly, 85th mtg (Dec 14, 1992), A/RES/47/68; *Resolution 51/122, Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries*, UN General Assembly, 83rd mtg (Dec 13, 1996), A/RES/51/122; *Resolution 62/101, Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects*, UN General Assembly, 75th mtg (Dec 17, 2007), A/RES/62/101.

5 The reference version of the IADC (Inter-Agency Space Debris Coordination Committee) space

posals like the Code of Conduct for Outer Space, drafted by the European Union in 2008, which has been discussed and modified many times since but has not reached an international consensus.⁶

These treaties and agreements are drafted in accordance with international law and should not be viewed in isolation of other public international law documents, such as the Charter of the United Nations.⁷

The space treaties are not self-enforcing; nations must pass legislation to carry out the provisions of the treaties. The United States Constitution, for example, regards treaty agreements as the “law of the land.”⁸ Consequently, in U.S. legislation dealing with space activities, the phrase “subject to U.S. international commitments” is routinely included to acknowledge the treaty provisions.

However, nations sometimes interpret the meaning of some of the treaty language differently in their national laws and regulations. For example, in article VII of the OST, nations are internationally liable for their space activities. To carry out this provision, there are a number of different types of indemnification regimes that have developed among the States. Thus, States have acknowledged their treaty requirement of being liable for any damage to another State, but at the same time, they have different mechanisms for carrying out that provision. There are, of course, other examples where States vary even more in their interpretations, and these continue to be open issues to be discussed and negotiated as future problems may develop in space affairs.⁹

The Outer Space Treaty contains a number of important basic principles for space activities. They include:

- The *exploration and use of outer space* is for peaceful purposes and for the benefit of all countries,
- International cooperation in space exploration is encouraged,
- All nations have the freedom to access, explore, and use space without discrimination,
- No State can appropriate space or declare sovereignty over celestial bodies,
- No weapons of mass destruction are to be used in space,
- States are internationally responsible and liable for their activities in space and for the activities of their non-governmental entities.

debris mitigation guidelines is contained in the annex to UN document A/AC.105/C.1/L.260.

6 European Union, DRAFT Code of Conduct for Outer Space Activities (version from March 31, 2014), online at http://eeas.europa.eu/non-proliferation-and-disarmament/outer-space-activities/index_en.htm.

7 UN Charter, 1 UNTS XVI. Article III of the OST specifically ties the OST to the provisions of the UN Charter.

8 US Const Art VI, ¶ II (“This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land...”).

9 Examples of this will be discussed in more detail later in the paper, particularly the issues of private sector exploitation of space resources.

First, it is important to note that the OST is a treaty that focuses on the exploration and use of outer space. It is a treaty dealing with human activities in outer space, not with space itself.

Second, it is important to note that a number of terms used in that treaty are not defined in the document. There is no legal definition of a celestial body, and there is no elaboration on exactly what the word “use” means – is it limited to governmental use, or can it include exploitation of areas or resources in space? There is not even a definition of peaceful purposes in the treaty. Further, the phrase “internationally responsible” is unique to this treaty in international law. The definition of what constitutes international liability is also missing from the OST (but it is clarified somewhat in the Liability Convention), and there is no elaboration of what constitutes an object launched into space (again, this is defined in the Liability and Registration Conventions, but in a very imprecise way).

To complicate issues even more, the treaties are translated into six languages (English, French, Spanish, Russian, Chinese, and Arabic) and each version is considered to be an official one. Not every word has identical counterparts in the various languages, giving latitude in interpretation and implementation of the respective provisions of the treaty.

III. MAJOR LEGAL CONCERNS OF GOVERNMENT SPACE PROGRAMS

The beginning of today’s space endeavors was the establishment of government programs during the 1950s, which sought to develop the ability to reach outer space by advancing missile and rocket technologies for three major purposes: 1) national security, 2) scientific research, and 3) the demonstration of technological prowess. The two superpowers of that era, the United States and the Soviet Union, were the only nations with both the commitment and the underlying technological capability and infrastructure to successfully initiate these programs. Early satellite programs reflected two clear goals: to monitor each other’s national activities through imagery and other instrumentation from outer space, and to develop and contribute to scientific inquiries on the nature of outer space, the means of using space technologies, and for contributions to international scientific knowledge. Sputnik was a Soviet instrument designed for civil government purposes as one of their contributions to the International Geophysical Year (IGY) in 1958, a multinational civil government effort to share information about the Earth (of course, the launch vehicle was a redesigned military missile, as were all launch vehicles of that era).

The huge monetary investments made by both nations during the 1960s space race to put a human being on the Moon reflected the political and economic potential of advancing cutting-edge technological capabilities for both civilian and military purposes. Each nation also courted international prestige by demonstrating space capabilities that no other nation was then capable of performing. Of

course, the United States' Apollo Program overshadowed the Soviet Union's space accomplishments through the successful landing of humans on the Moon in July 1969, but both nations developed the ability to routinely access and use space.

As a result, the legal focus on space exploration reflected several political realities. Among these are:

- Public safety and liability – determining that launching into space, as well as operating satellites in orbit, is a potentially very hazardous activity and assuring all nations that if something put into space or was intended to be put into space from a launch caused damage to another nation, then the innocent victim would receive compensation.
- Colonization – the fear that nations would claim space or planets for their own use and that this would be a new source of international conflict.
- The necessity of prohibiting nuclear devices from being detonated in space due to the threat of a very large amount of damage to anyone's ability to use outer space.
- Avoiding the possibility that space would be a platform for military operations against other nations.

These, and other government concerns, were quite apparent in the negotiated principles found in the treaties and discussed above. Today, they remain important issues for shaping government space policies and programs. Since all space-faring nations are States Party to the OST, these initial principles that were of particular concern to the United States and the Soviet Union in the 1950s and 1960s have been preserved on an international scale and are applicable to all space activities.

However, the treaties only provide for diplomatic negotiations for the enforcement of these principles. Only the Liability Convention has provisions for a more formal adjudication of claims, but this option has never been used by any nation.

IV. EXISTING PRIVATE SECTOR SPACE-BASED APPLICATIONS

By approximately 1980, space technology had begun to mature, and many technological capabilities could be developed for both government customers and civilian users. Most notably were telecommunications services and remote sensing (taking pictures of the Earth from space). Other nations were able to initiate their own space programs, as well. Access to space was no longer limited to two nations, and the uses of space were widening to many different types of customers.

Within the following two decades, because of both a combination of government policy (particularly in the United States) and the spread of technological capabilities, private sector interests were attracting investment, and government agencies were also promoting space uses to the public. The largest revenue generating space service by the late 1990s was (and still is) direct television broadcasting.

Telecommunications services are also an important segment of the space market, offering both fixed and mobile products. In the United States, telecommunications satellites were always manufactured and operated by the private sector but were under heavy government regulations. As with other space-based technologies, it wasn't until the late 1980s that truly private operations began to compete with international intergovernmental organizations such as Intelsat. The opportunities and services developed fast, and by 2000, the telecommunications sector had changed from mainly government dominated to privately run (but still under significant regulatory oversight as with all space activities). Even Intelsat was privatized and is now a large multinational company.

Also heavily regulated and government dominated in all nations is the launch vehicle industry. However, in the 1980s, the United States began to incentivize its private contractors to develop commercial launch vehicles. This trend has continued, and launch vehicle manufacturing and launch operations are now contracted services for government and private satellite customers. In the United States and most other countries, the government(s) are still the primary customers of these companies, but commercial launches now account for approximately 25% of all launches worldwide.

In terms of revenues generated, the next largest space-related business after direct TV broadcast satellites is the use of position, timing, and navigation (PNT) signals that include, among other instruments, a signal that is available and free to use by anyone in the world. Although the U.S. GPS satellite system is a military system and is not privately financed or managed, many valuable and profitable terrestrial applications using this signal (sometimes in combination with similar signals from non-U.S. PNT satellites) have generated a private sector service industry with annual worldwide revenues measured in the billions of dollars.

The third major private activity in space are earth observation satellites that take imagery of the Earth's surface. What began as a government system, with the first United States satellite for civilian purposes launched in 1972 (ERTS-1, later re-named Landsat 1), has now expanded into a system of highly sophisticated imaging satellites, many owned and operated by not only U.S. private firms, but also by non-U.S. governments and companies. The imagery products and services generate relatively modest commercial sales but show a trend towards increased market penetration.¹⁰

All of the above examples are space applications oriented toward terrestrial activities and customers. The importance of outer space to these activities is primarily that space is an advantageous location from which to receive signals from ground stations on earth and then re-direct and redistribute those signals and

¹⁰ Because of the dual-use nature of this (and most other) space capabilities and services, sales to governments, as well as government funding of remote sensing satellites, represent a major part of the sales and profitability for the business aspects of these companies.

rebroadcast them from space easily and cheaply to customers almost anywhere on earth. Very little reprocessing or “manufacturing” actually takes place in space, except for the maneuvers that keep the satellites in their correct locations.¹¹

V. NEW DEVELOPMENTS: THE RISE OF PRIVATE SECTOR INITIATIVES IN SPACE

It is apparent that today the space sector is on the cusp of successfully developing a number of enabling technologies that will make it possible to routinely do many things in outer space that have been previously impossible. A number of these capabilities will be performed not by government agencies, but by private companies working independently of governments, as well as in close partnerships with some governments where joint R&D and operations enable both to benefit.

Some of those activities in orbit that are being developed and tested are:

- Refueling and servicing of existing satellites,
- Deorbiting satellites and removing human-created space debris,
- Protecting the Earth from an asteroid’s direct impact by repositioning the asteroid away from a trajectory headed for Earth,
- Developing the framework for future in-situ use of resources found on celestial bodies including the Moon and asteroids,
- Developing the ability to bring back to earth valuable resources obtained from celestial bodies,
- Building space power satellites capable of providing energy to space assets, as well as possibly beaming energy to earth,
- Deploying swarms of very small satellites in low earth orbit that will interact and provide remote sensing images, new telecommunications services, and universal broadband connectivity.

Not all of these capabilities will be immediately available, nor will many of them provide profitable opportunities for private investment and risk-taking in the very near future. But companies are being formed and serious investment funds are being made available that support these activities. Over time, at least some of these space-based in-orbit activities will be successful on both a technological and an economic basis.

VI. THE CHANGING PATTERN OF IMPORTANT LEGAL ISSUES: CONCERNS OF THE PRIVATE SECTOR IN SPACE ACTIVITIES

The central question of the future developments in space law is likely to focus on how governments will adopt and regulate these new types of private

¹¹ The minor exception to this are the cameras on the earth observation satellites that do generate imagery in space and then send that digital imagery to ground stations.

sector activities in outer space. Because the treaty regime puts the onus on governmental supervision of national activities in space, and it specifically includes the activities of non-governmental entities, governments have an obligation to be involved in ensuring that the companies operate in a responsible and safe manner in space.¹² Furthermore, if an accident occurs in space and a company is found to be at fault, ultimately the government of at least one of the launching states of the space asset that was responsible for the incident can be held liable for damages.¹³

At the present time, most nations do not exert much regulatory authority over activities that are occurring on-orbit. Most of the national legislation that regulates space is concerned with launching activities, which historically have seen relatively high failure rates coupled with the immediate threat of damage to property or loss of lives terrestrially. Thus, nations transfer some of their financial exposure by requiring private launch operators to purchase insurance. Because there is a possibility of catastrophic damage from space launches, nations also often specifically agree to indemnify third party victims if the losses exceed the insurance coverage.

On-orbit regulations that now exist focus mainly on approvals for the use of spectrum for communications to avoid interference, and they also focus on allocating positions in the relatively crowded region of the geosynchronous orbit. Nations are beginning to develop better means of determining what is actually in orbit in order to inform users of possible collisions in space and avoid future accidents. It is only in recent years that nations have begun to require companies to implement designs to minimize future debris creation in the space environment. Other formal on-orbit regulations include extending the launch period to make sure the satellite gets to its proper orbit and, if the vehicle is scheduled to return to Earth, the government has oversight in the preparations for that return.

Beyond that, nations may examine a payload to be launched to ensure that it is safe and will not endanger either the launch itself or its operations in space. But actual requirements for safety, insurance, and other operations of on-orbit activities have not been implemented, mainly because these activities up to now have either not been accomplished or have only been performed by government agencies themselves.¹⁴

Besides complying with government regulations, the private sector typically is oriented toward making a profit on their investment.¹⁵ These firms are quite

12 OST, Art VI (cited in note 3).

13 Liability Convention, Art III (cited in note 3).

14 The United States Government has issued many detailed manuals governing the safety and responsibility of its own operations in space, both by NASA and by the Department of Defense. Because the Government self-insures, it assumes all of the risks that may be involved, including those associated with carrying out the provisions of its treaty obligations.

15 Many new space entrepreneurs today are very wealthy people putting a significant amount of their personal wealth into developing space capabilities. Some profess to be interested in exploration and

aware of the government's treaty obligations, but these obligations may be viewed differently. For instance, governments are very concerned about liability, but as is the case with the U.S. Government, they self-insure their space activities. Companies are concerned with liability as well, but with a difference – they purchase insurance to cover the potential liabilities, and then the cost of the insurance can be factored into the price to the customer.

The following table summarizes some of these differences that can translate into major contracting and legal issues:

Government	Private Sector
Mission success	Operational system
Longer-time frame; limited by annual budgets	Short term focus: profit/cash flow Exception: private entrepreneur funding
Public welfare	Maximize profit
National security	Sustainable operations
Cost effectiveness	Least cost, maximum efficiency
Next engineering/science program	Next consumer/client product
Budget priorities	Private financing/ROI
Authorization/appropriations	Cash flow
Separate R&D, construction, operations budgets	Plan for life cycle funding
Treaties, law, regulations for the public good	Regulatory hurdles, compliance, taxes/user fees

Factors such as the high financial and regulatory barriers to entry into the business; the relationship between safety, cost, price; and maintaining a high degree of reliability and quality are reflected in the future legal issues. Typically, governments are extremely safety-conscious in space missions, particularly if human beings are in space. Companies are also deeply concerned about passenger safety, but they often do not have the same budgets that governments have to ensure the same degree of safety. This can translate into an issue that possibly increases pri-

in long-term benefits, such as developing settlements on distant planets or performing space activities less expensively than the government can, and that may be quite true. However, these people are also not quite that altruistic. They did not acquire their fortunes by being poor businessmen. They do see profits in the future, even if that future may be longer than a shareholder business firm can reasonably invest in. They also see applications of their new technologies that may have shorter term terrestrial economic potential. It can be argued that economic motivations are just as strong for these entrepreneurs as they are for public companies.

vate sector risks.¹⁶

Companies eventually will need to get financing from private sources. Investment companies and investors are very conservative and, unlike governments that invest for the public good and for longer-term benefits, private investors have to justify a rate of return to the investment in shorter time frames that equals or exceeds alternative uses of those investment funds.¹⁷

Space project investments are difficult to explain and to justify under these conditions; therefore, companies seek ways of reducing risks. Governments often can help in some respects through R&D investments, guaranteed purchases of goods and services, cooperative projects, and through regulatory assurances.

The details may vary, but the bottom line is that companies clearly recognize the importance of working with governments on many outer space projects. They also recognize that a regulatory regime will be in place to carry out government commitments from treaty and other international agreements, as well as to ensure domestic safety rules and regulations.

Governments that want to encourage private sector initiatives often develop financial and contracting incentives. Companies also expect and require that a national regulatory framework is predictable, stable, and as transparent as possible.

VII. PROPERTY RIGHTS IN SPACE

A much debated and controversial issue focuses on the rights of both governments and private entities to use and exploit resources found in space. Analyzing this issues illustrates the tensions between the treaty language itself, the interpretation by a national government of its treaty obligations and the reality of providing incentives for the emerging commercial development of space

Historically, the removal of resources from space has been limited to the United States' and the Soviet Union's returning of samples from the Moon during the 1960s and 1970s, and to a small sample of asteroid materials that the Japanese Hyabusa Mission accomplished in 2010. In each case these were government missions and the returned samples were used primarily for scientific purposes. Each government considered the samples their own property and the samples were not marketed commercially, except for a public auction of some samples that Russia

16 Of course, even the best efforts of governments don't guarantee safety. Outer space is a risky and difficult environment. And companies correctly argue that they'll be essentially out of business if there is a serious accident that causes loss of life to a paying customer. They also argue that there very well may be methods of achieving the level of safety that large budgets can purchase with newer or different (and less expensive) technologies. To date, there have been no commercial human space flights, so there are no data available to prove either side of these arguments.

17 In economics, this is called the opportunity cost of money.

permitted.¹⁸

The United States Government prohibits the sale of any Moon rocks collected by the U.S. Government and legally enforces this with criminal penalties. Clearly the ownership of those space materials rests with the government(s), and there have been no international challenges to the rights of governments to both return resources from space and to legally protect them.

A detailed discussion of all of the legal implications of property rights in space is beyond the scope of this brief article.¹⁹ Suffice it to say that property rights do exist in outer space. Anything that is launched from Earth to outer space is owned by the launching state, and that state is internationally responsible and liable for those space objects.²⁰ This includes all instruments and equipment left on the Moon by various exploratory missions (but it does not imply that the territory underlying the equipment is also owned). By internationally negotiated agreements through the International Telecommunications Union (a U.N. organization), locations in the geosynchronous orbits are assigned to different satellites, and a zone around those satellites is also protected to ensure safety and to minimize spectrum interference. On the International Space Station (ISS), each partner nation owns and controls its own modules and can apply its own laws, including intellectual property law, to activities performed on those modules.²¹

However, all of the above property rights are limited by international agreements and supervised by the various nations' laws and regulations.

The current legal issue is whether private entities can remove valuable resources from celestial bodies and then be assured that they can have the right to use, sell, transfer, or lease those resources.

The Outer Space Treaty, most international lawyers would argue, does not directly permit such activities by private entities or governments. But, at the same time, the wording in the treaty also does not specifically preclude the ownership of resources. Specifically, Article II of the OST states:

“Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”²²

This provision is oriented towards any celestial body itself and prohibits

18 Moskowitz, Claire, *Largest Moon Rock Ever Auctioned Could Fetch \$380,000* (Space.com, Sept 18, 2012), online at <http://www.space.com/17650-moon-rock-lunar-meteorite-auction.html>.

19 For a more detailed account, see Henry Hertzfeld, and Frans von der Dunk, *Bringing Space Law into the Commercial World: Property Rights without Sovereignty*, 6 Chi J of Intl L 81 (2005).

20 OST, Art VI and VII (cited in note 3).

21 Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States Of America Concerning Cooperation on the Civil International Space Station, US Department of State (1998), online at <http://www.state.gov/documents/organization/107683.pdf>.

22 OST, Art II (cited in note 3).

a nation (or by extension through Article VI, a non-governmental entity) from declaring sovereignty and appropriating a celestial body such as a planet or asteroid. The question concerning resources relates to the phrase “*use or occupation*” of that celestial body. Since the OST itself is for the “*exploration and use*” of outer space, there is a contradiction and vagueness about what use really means. This is compounded if one refers to the Moon Agreement where the term, exploitation, is added and where Article XI specifically discusses the possibility of future commercial space applications, but does call for an international framework for such activities.²³

Given the ambiguities in the language of the treaties, and the fact that in order for any nation (or company) to use outer space, some type of physical activity involving the removal of resources from a celestial body will be necessary. It will then logically be within the realm of national law to develop an interpretation of the treaty language and develop a legal and regulatory regime for using resources found in outer space and on celestial bodies. It will also be imperative that nations, in developing these regimes, abide by the principles of the treaties including: accepting responsibility and liability for their actions in space, avoiding or minimizing the contamination of outer space and intentional harmful interference to other nations and their space activities, allowing for the freedom of access of others, and using space resources for peaceful purposes.

An effort in that direction has been initiated by the United States. Following a long-standing policy,²⁴ the U.S. Congress passed U.S. Commercial Space

23 Even though the Moon Agreement has not been ratified by the major space-faring nations, sections of it can still be viewed as a window into the thinking and intent of the drafters of the earlier treaties. And even within the Moon Agreement, there are contradictions, since Article VI deals with resources on the surface and subsurface of the Moon but then refers specifically to removal or use for scientific purposes. In other words, there are no crystal clear resolutions of the question at hand in the treaties.

24 Letter from Secretary of State Vance to Senator Church, Chairman of Senate Foreign Relations Committee (Nov 28, 1979), reprinted in *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, Senate Committee on Commerce, Science and Transportation (Aug 1980) at 313 (stating that the Moon Treaty provides no moratorium on exploitation of space resources, that Art II of the Outer Space Treaty’s ban on appropriation only applies to resources in place, and that the Outer Space Treaty and Moon Agreement would allow for ownership of extracted space resources); See also *Testimony of State Dept. Legal Advisor Owen in Hearings Before the Subcommittee on Science, Technology and Space of the Senate Committee on Commerce, Science, and Transportation on Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 96th Cong, 2d sess 2–19 (1980) (both oral and written testimony) (“American companies will have a continuing legal right to exploit the Moon’s resources....”; “...once [resources] have been extracted from the Moon, ownership can be asserted at that point...”; “exploitation [can] go forward and that one can own what one can remove from the surface or subsurface of a celestial body...the negotiating history [of the Moon Agreement] makes it very clear that that was contemplated by the parties.”; “The United States took the position from the outset that such exploitation should be permitted, that such ownership after extraction should be permitted. And that...is an authoritative interpretation ...”; “... we have insisted that even after such a regime is established [an international one under the Moon Treaty], the right of unilateral exploitation will continue to be available to those States which choose

Launch Competitiveness Act (H.R. 2262), and it was signed into law by the President on November 23, 2015. Title IV of that Act specifically grants property rights for obtained abiotic resources from celestial bodies to companies operating under the jurisdiction of the United States. The Act also specifically emphasizes that this is not a declaration of U.S. sovereignty over any celestial body.

Although these provisions of the Act dealing with property rights are controversial, it is interesting to note that not only have companies in the United States supported the Bill, but a recent statement of the International Institute of Space Law has acknowledged that the treaties are not clear on the resource issue and that actions of the U.S. Congress are a “possible interpretation” of the treaty language by a State Party to the Outer Space Treaty.²⁵

It should be emphasized that this new U.S. legislation is a broad statement that assures industry that the U.S. Government is committed to supporting private sector development in space. However, the many details of how this new law will be implemented through the licensing and regulatory regime for space that exist in the United States are not specified. Moreover, since actual resource mining and use in space is still many years in the future and the technologies are still under development, it is proper that the details be left to the appropriate time and the appropriate regulatory body to consider when a company or companies have demonstrated specific plans for this type of commercial activity.

Further, there will be different interpretations of the validity of this new law, particularly from other nations. The discussion and possible legal challenges on an international level will be intellectual, political, and emotional. The result is impossible to predict, but it is likely that either the principle of resource property rights will be upheld or that efforts will be made to draft a new treaty with less ambiguous terminology than now exists in the current space treaties.

VII. MAJOR SPACE LEGAL ISSUES YET TO BE ADDRESSED

The most important international legal issues that will need clarification and better definition as commercial interests expand in space are:

- Distinguishing sovereignty from ownership, property rights, and liability,
- Defining and identifying a nation’s responsibility under Article VI of the OST when assets in space are sold, transferred, or otherwise disturbed by the nation that is not the launching state nor state of registry,
- Similarly, linking the registration of a space asset to actual jurisdiction and control of the appropriate state, not just the jurisdiction and control of the first launching state and/or the state of registry,

not to participate in such a regime”).

²⁵ International Institute of Space Law, *Position Paper on Space Resource Mining*, adopted by consensus by the Board of Directors on Dec 20, 2015.

- Identifying and defining the difference between a launch from earth and a launch from a space-based asset,
- Clearly defining a new liability regime for in-space incidents that doesn't contradict or violate any provisions of the Liability Convention,
- Providing for an international binding and enforceable system of dispute resolution for space incidents.

Essentially, the above issues revolve around three principles: (1) *state responsibility* being attached to the most logical state(s) associated with a space asset, (2) the avoidance of one state performing an action that results in *harmful interference* with the assets of another state while in outer space, and (3) *resolving any disputes* in outer space peacefully, effectively, and in a fair and impartial manner.

Today, none of these legal principles are well-defined. So far, the world has been lucky, and there have been no in-space incidents that have occurred that have (1) not been resolved by diplomatic negotiations, and (2) have created enough economic damage in space to warrant a test in a court of law.

The space community should not wait for the inevitable test case. If we do, any hasty solution will be too little, too late. And it would likely be a patchwork of ineffective compromises, or oriented toward one particular situation to ensure that that particular type of incident won't occur again. Governments may be able to settle disputes involving government assets, but when the mix includes valuable commercial assets, the need for a more formal set of definitions and rules will be necessary.

The above issues are now being discussed in academic and government venues. In the more immediate future, establishing a legal and regulatory system that meets the needs of the changing structure of public/private space activities is crucial to all space-faring nations. Developing a balanced approach that addresses the existing treaty obligations with the economic and political realities of today's world that will both incentivize private investment in space, as well as ensure the sustainability of future uses of space, will be a difficult but necessary international challenge.